

Agiflite

BATTERY CHARGER OPERATORS HANDBOOK

This document is provided to give the user an understanding of the battery charger so that it may be used intelligently and maintained in a serviceable condition.

Queries regarding any matter concerned with the battery charger which is not covered in this document should be communicated to :

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AGIFLITE CONSTANT CURRENT AUTOMATIC ELECTRONIC CHARGER

Part No. 20632/200

NSN 2VH6760-01-158-0623 SF

INTRODUCTION

1.1. The Agiflite charger is designed primarily for charging the nickel cadmium batteries used in the Agiflite camera (camera set KS-144A). The unit is a constant current automatic electronic charger which will charge up to three batteries simultaneously. The facility is also available for charging any sealed nickel cadmium batteries with capacities up to 6Ah and up to 30 cells in series connection.

1.2. An important feature of the Agiflite charger is the timer with facilities to provide pre-selected periods from 1-14 hours so allowing the unit to be left unattended once the charging cycle has been commenced. The charger will operate from a mains supply of 240V a.c. 50Hz or 110V a.c. 60Hz, adjustable on the rear cover.

DESCRIPTION

General

2.1. The battery charger is housed in a metal case designed as a bench unit which is portable, having a carrying handle in the centre of the top face of the case. The unit weighs 5.25Kg (12 lb).

The plug PL1 mounted on the rear cover is for selection of 110V 60Hz or 240V 50Hz to suit the mains supply to which the unit is to be connected. The battery charger should be used on a hard flat surface to ensure adequate ventilation.

Front Panel

2.2. The mains on switch SW1 is positioned centrally on the right-hand side of the front panel with the mains-on indicator and fuse FS1 positioned to the left of the switch. Centrally at the top of the front panel is the current range switch SW2. There are two current ranges for the external output, 0 to 60mA and 0 to 600mA, the current being adjustable over the selected range by the knob for VR2 immediately below the current range switch, the charging current being displayed on the meter MR1. When switched to internal charge the 0 to 60mA output is connected to the battery holders but the 0 to 600mA range output is disconnected in order to avoid over-charging of the Agiflite batteries.

2.3. The timer is situated in the top right hand corner of the front panel and is graduated in hours from 0 to 14. The timer incorporates an on/off switch which switches on the charging current at 14 hours when rotating the timer knob anticlockwise and switches the charging current off when the timer reaches zero.

2.4. In the bottom left hand corner of the front panel is an output selection switch SW3. When switched to external the charging current is through two terminals, negative and positive, immediately above the switch. When switched to internal the charging current is fed to the three battery holders to the right of the switch. The battery holders are connected in series across the output of the charger through a spring loaded contact forming the negative contact of the battery holder. The spring loaded contact is broken on insertion of a battery and connection of the battery completed by fitting the battery securing cap to the positive end. This enables a single battery to be charged or up to three batteries at any one time.

CIRCUIT DESCRIPTION

3.1. The unit comprises a d.c. power supply unit and a constant current circuit which together operate as a constant current charger having an input of 110V/240V a.c. and an output of up to 600mA.

Power Supply Section

The power supply section comprises :

SW1	Mains switch
FS1	Fuse
N1/R4	Neon Indicator and resistor
M1/TSW1	Timer and switch within timer
TR1	Transformer
PL1/SK1	Voltage selection plug
C2/R5	Suppressor
D3-6	Bridge Rectifier
C1	Smoothing

3.3. The mains indicator neon N1 is connected for 110V operation with R4 being connected in series during 240V operation via mains selector plug PL1. This selector plug also connects the windings of the mains transformer TR1 into parallel for 110V working and into series connection for 240V working. The timer motor M1 is again 110V rated and is connected across one winding of the transformer TR1. The timer controls a cam operated micro switch TSW1 which, in turn, removes the mains input to the unit when the selected charging time has expired. Transformer TR1 provides 55V RMS to D3-6 which is connected as a full wave bridge rectifier, with resistor R5 and capacitor C2 providing spike suppression, the main smoothing being by capacitor C1. Approximately 75V d.c. is available across C1.

Constant Current Circuit

3.4. The charging current is controlled by VT1 comparing the voltage developed across sensing resistors R2, R3 with that developed across VR1. The voltage across VR1 is stabilised by D1 and D2 prevents back feeding from the battery being charged. Fuse FS2 provides protection should a fault develop in the charging circuit.

3.5. Resistors R6, R7, R8 and VR2 together with MR1 form the current metering circuit, VR1 providing calibration of the two metered ranges.

Switch SW2 is the current range switch and has three functions. One contact shorts R2 in the higher range position so providing a high current driving capability, one contact shorts R7 in the higher range position reducing the value of shunt resistance across the meter, and the other contact disconnects the internal battery holders in the higher range position.

INSTALLATION

4.1. Adjust the voltage selector plug on the rear cover of the unit to suit the mains supply available. The battery charger will operate from a mains supply of 240V a.c. 50Hz or 110V a.c. 60Hz.

4.2. A plug suitable for the supply socket must be fitted to the mains input cable. Connect :

BROWN	to	LINE
BLUE	to	NEUTRAL
GREEN/YELLOW	to	EARTH

NOTE : The charger must be used on a hard, flat surface to ensure adequate ventilation.

BATTERY

5.1. Batteries used in the Agiflite camera are :

*VARTA DKZ 500
VARTA DKZ 600
BEREC NCB 60VA

or any equivalent sealed nickel
cadmium cell battery

*superseded by DKZ 600

5.3. The sealed nickel cadmium cell battery is designed to withstand extremes of mechanical vibration and shock and is not affected by prolonged storage, in any state of charge, provided the permissible temperature range, shown in the table of battery characteristics, is observed.

Characteristics of Battery

5.3. Capacity	VARTA DKZ 500	500mAh
	VARTA DKZ 600	600mAh
	BEREC NCB 60VA	600mAh

No. of films - 5 recommended
10 possible

Life 2 to 6 years depending on use
300 to 400 cycles of charge and discharge

Efficiency Approx 70%

Storage In a clean dry atmosphere and in a discharged state

Maintenance charging not required

Temperature
0° to + 45°C recommended
- 40° to 50C possible

Charging Rate : 50mA for 500 mAh rated batteries
60mA for 600 mAh rated batteries

Temperature for charging environment
+10°C to +35°C recommended
0°C to +45°C possible

Operating
Temperature Range 0°C to +45°C recommended
-20°C to +50°C possible

BATTERY CHARGING PERIOD, AGIFLITE BATTERIES

6.1. A battery which has been discharged down to a voltage of 10V d.c. requires the application of a 50mA/60mA charging current for 14 hours to bring it to a fully charged condition.

NOTE : THE BATTERY SHOULD NOT BE DISCHARGED BELOW
10V d.c. WHEN MEASURED WITH A 22 OHM LOAD.

6.2. However, the framing rate of the camera is dependent on the battery voltage; therefore to maintain a framing rate of around 2 frames per second the battery should not be allowed to fall below 12V d.c. when measured with a 22 ohm load.

6.3. Check the battery voltage using a 22 ohm load and determine the charging period required from GRAPH 1. Over charging a battery will cause the cells to swell, but one hour over-charge at a 50mA/60mA charge current will not have any detrimental effect on the battery.

OPERATION, AGIFLITE AND OTHER BATTERIES

Operation for Charging Agiflite Batteries

7.1. To set up the battery charger :

- (1) Set the CURRENT SELECTION switch to 60mA and the CURRENT SELECTION adjustment control knob (below the switch) fully counter-clockwise to MIN.
- (2) Check that the TIMER knob is set with the indicator line on the bezel opposite the black section of the scale.
- (3) Set the OUTPUT SELECT switch to INTERNAL.
- (4) Remove the BATTERY 1 cap by twisting it counter-clockwise and withdrawing it. Place the discharged battery into its recess, negative end first and refit the cap, pressing it and turning it clockwise to secure.
- (5) If necessary repeat step (4) for BATTERY 2 and BATTERY 3.
- (6) Plug in the mains supply lead and, if necessary, switch on the mains.
- (7) Set the MAINS switch on the charger to ON and check that the adjacent lamp is lit.
- (8) Turn the TIMER knob counter-clockwise until the indicator line on the bezel is opposite the charging period required (para. 6.1). When the charging period has expired the timer will switch off the charging current.
- (9) Turn the CURRENT SELECTION control knob clockwise until the CHARGING CURRENT meter indicates 50mA or 60mA as required for the battery. Check that the CURRENT SELECTION switch is set to the left (60mA).
- (10) When the CHARGING CURRENT meter and the TIMER both indicate zero, remove the charged battery, or batteries, switch off the MAINS switch and switch off or disconnect the mains supply.

Operation for Charging Other Batteries

7.2. To set up the battery charger :

- (1) Set the CURRENT SELECTION switch to the range required 0 to 60mA or 0 to 600mA and the CURRENT SELECTION adjustment control knob (below the switch) fully counter-clockwise to MIN.
- (2) Check that the TIMER knob is set with the indicator line on the bezel opposite the black section of the scale .

- (3) Set the OUTPUT SELECT switch to EXTERNAL.
- (4) Connect cells or cell to charger using the red and black crocodile leads ensuring that POSITIVE (red) and NEGATIVE (black) are connected to the cells correctly i.e. POSITIVE to POSITIVE and NEGATIVE to NEGATIVE.
- (5) Plug in the mains supply lead and, if necessary, switch on the mains.
- (6) Set the MAINS switch on the charger to ON and check that the adjacent lamp is lit.
- (7) Turn the TIMER knob counter-clockwise until the indicator line on the bezel is opposite the charging period required. When the charging period has expired the timer will switch off the charging current.
- (8) Turn the CURRENT SELECTION control knob clockwise until the CHARGING CURRENT meter indicates the current required.
- (9) When the CHARGING CURRENT meter and the TIMER both indicate zero, remove the charged battery, or batteries, switch off the MAINS switch and switch off or disconnect the mains supply.

CHARGING OF BATTERIES OTHER THAN AGIFLITE BATTERIES

- 8.1. The re-charging of discharged nickel cadmium batteries is achieved by applying the correct constant current for a period of 14 hours.
- 8.2. The correct charging current for nickel cadmium batteries is 1/10th of the rated capacity and is known as the I_{10} rate e.g. a 500 DKZ cell has a rated capacity of 500mAh; therefore

$$\frac{500}{10} = 50\text{mA}$$
 which is the correct charging current. As a further example an RS4 has a capacity of 4Ah; therefore

$$\frac{4000}{10} = 400\text{mA}$$
 which is the correct charging current.
- 8.3. The 14 hour charging period at the correct charging rate is for discharged batteries. Where the state of charge of the battery is unknown but it is not fully discharged, it is advised that a factor of 1 to 1.2 is used rather than 1.4. This means that to use a 14 hour charging period on a battery which is in an unknown state of charge the current should be reduced by approximately 20% for best results, or alternatively, the timer should be set for a 12 hour period at the 10 hour (I_{10}) rate.

- 8.4. It is possible to charge cells of greater capacity than 6Ah with the AGIFLITE charger by doubling the time of charge. This can be achieved resetting the timer knob for a second cycle when the charging period for the first cycle has expired, e.g. if it is required to charge a 7.5Ah cell the time would be for 28 hours (double) and therefore would require half of the normal charge current

$$\text{(i.e. } \frac{7500}{20} = 375\text{mA)}$$

The rules to observe are :

The current should not exceed the $\frac{1}{10}$ rate (1/10th of the rated capacity) and the total charge in mAh applied to the cell (cells) should be 1.4 times the rated capacity.

From the above example :

$$\text{current } 375\text{mA} \times \text{time } 28 \text{ hours} = 10500\text{mAh}$$

$$\text{Proof : } 7,500\text{mAh} \times 1.4 = 10,500\text{mAh}$$

SERVICING

- 9.1. Servicing is limited to cleaning of the unit and a calibration of the charging current output.
- 9.2. If the unit does become unserviceable first check the fuses FS1 and FS2.
- 9.3. Fault Finding of the unit should, with reference to the circuit diagram and circuit description, be well within the capabilities of an electronic service engineer even without any previous experience of the equipment. Having located the fault, replacement of any faulty components is aided by reference to the spare parts schedule.

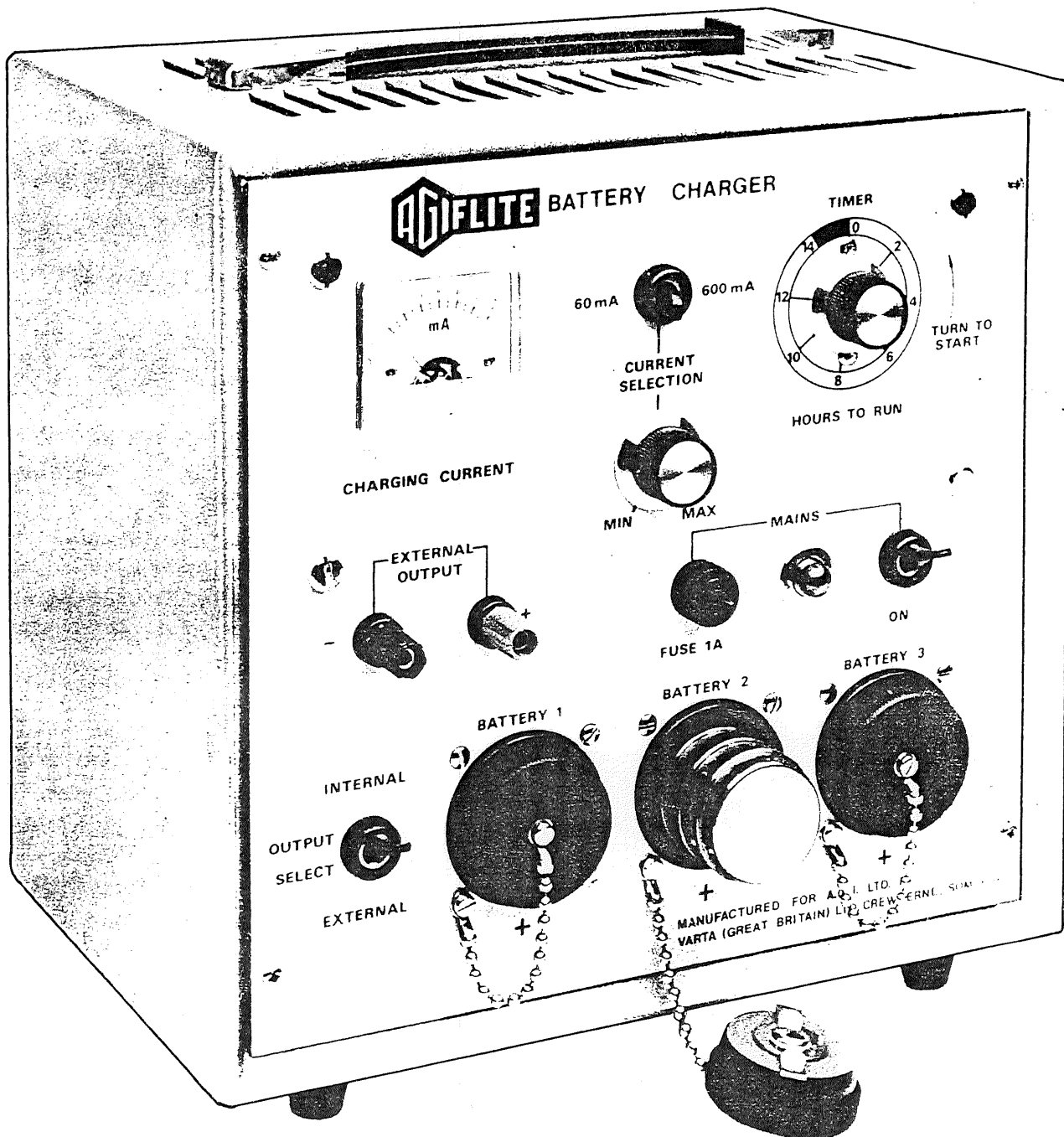
CALIBRATION CHECK

- 10.1. A calibration check shall be made whenever a component is damaged or a fault occurs within the constant current circuit.
 - (1) Connect an ammeter across the external output terminals and set to 100mA range.
 - (2) Switch SW3 to EXTERNAL.
 - (3) Switch SW2 to 60mA range (SW2 open circuit on R1 & R7)
 - (4) Plug in the mains supply lead and, if necessary, switch on the mains.
 - (5) Set mains switch SW1 to ON and check that the adjacent lamp is lit.

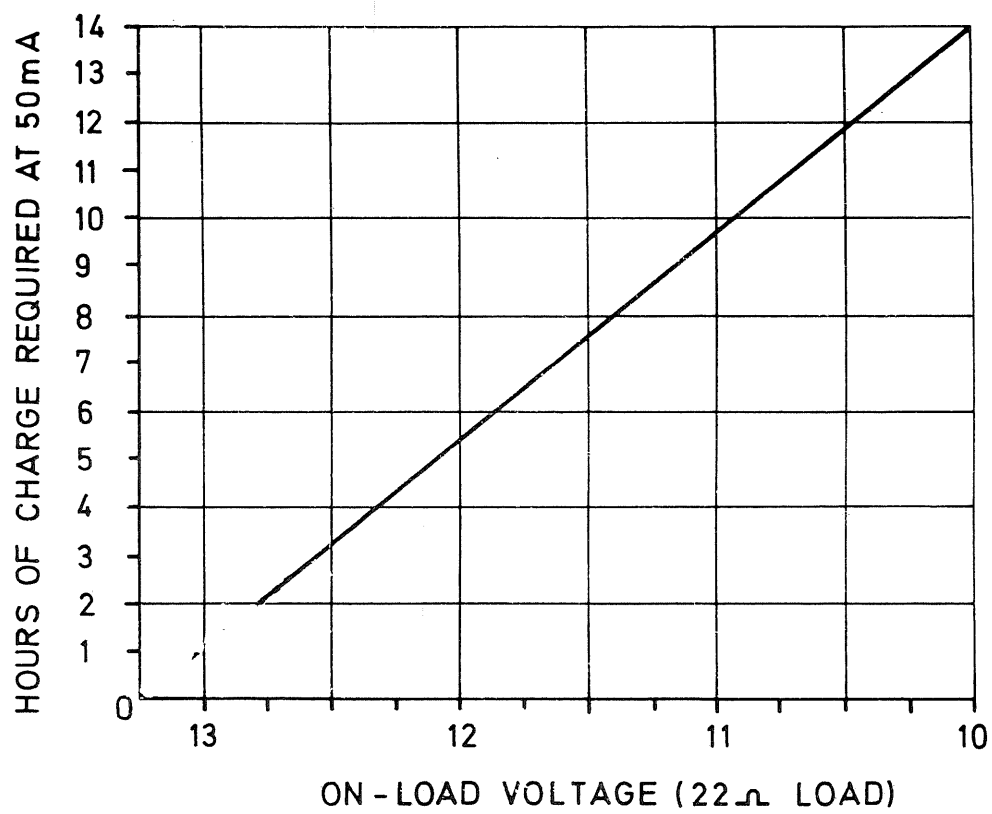
- (6) Turn the timer knob counter-clockwise to any charging period to switch on charging current.
- (7) Set the CURRENT SELECTION knob VR2 to full scale on meter MR1.
- (8) Set VR1 for 60mA output.
- (9) Set ammeter across output terminals to 1 A range.
- (10) Switch SW2 to 600mA range (SW2 closed circuit on R1 & R7)
- (11) Outout should be 600mA. Adjust VR1 to obtain an equal magnitude but opposite polarity error on both ranges.

SECTION 11
SPARE PARTS SCHEDULE

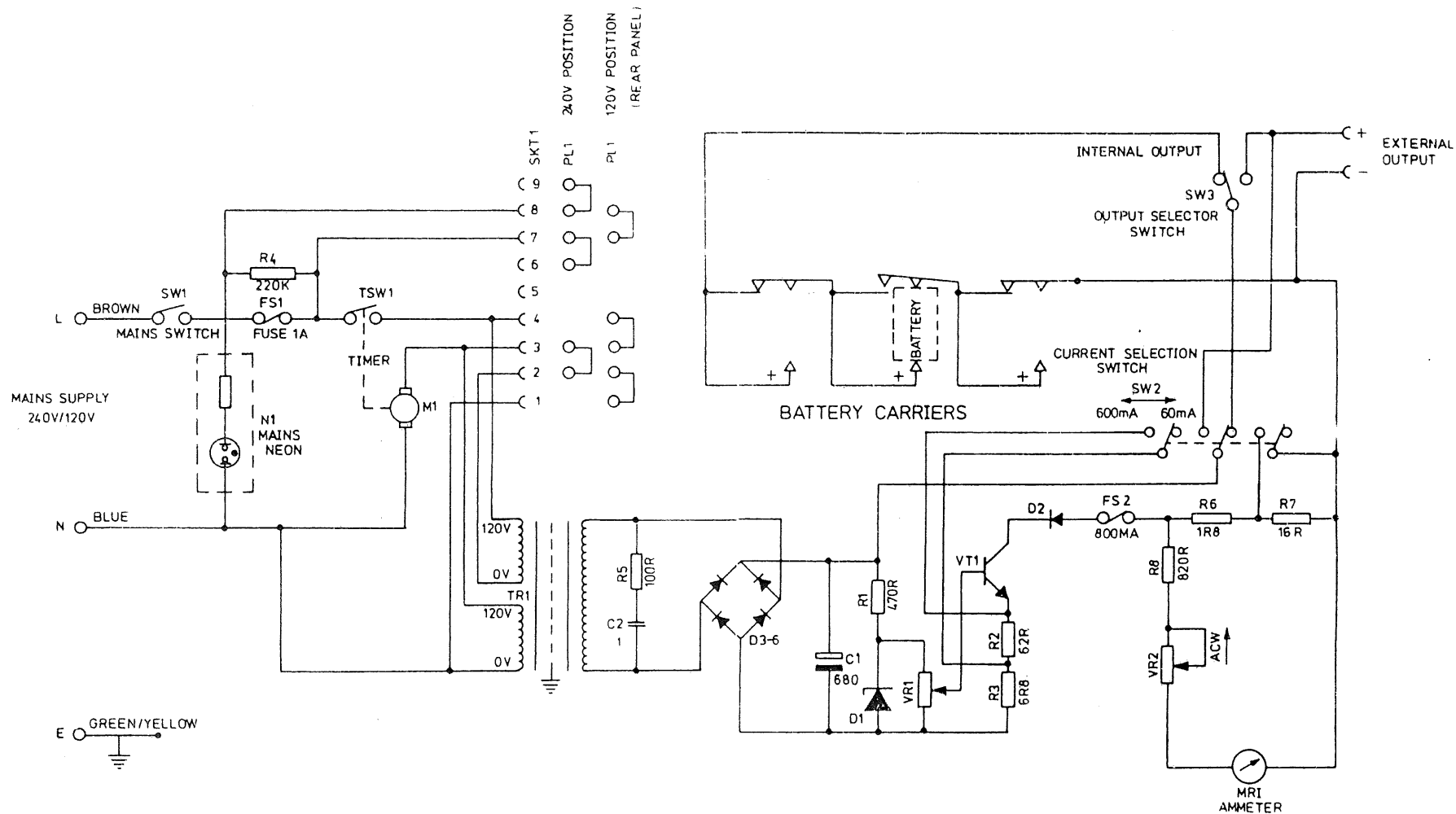
Item No.	Drg No.	Component	Qty per	Specification	Manufacturer	Circuit Ref.
1		Timer	1	No.88.256.4 15 hrs. 120/220V 50Hz	Crouzet	
2		Meter	1	'Sew' 0-1mA 100 ohm MR38P 8500H	ITT	MR1
3		Potentiometer	1	CLR 4001/11S 100 ohms	Colvern	VR1
4		Switch	1	SPST 8045G	Arrow Hart	SW1
5		Terminal	1	E6020/1/09/RED	Belling Lee	SK2
6		Terminal	1	E6020/1/09/BLACK	Belling Lee	SK1
7		Fuseholder	1	No. L1348C	" "	
8		Fuse	1	1A Antisurge $\frac{1}{2}$ " x $1\frac{1}{2}$ "	" "	FS1
9		Neon	1	SL190 RED 120V	Arcoelectric	N1
10		Capacitor	1	680uF 100V Electrolytic	Erie	C1
11		Switch	1	12156 AG	APR	SW2
12		Resistor Moulded Carbon	1	220K $\pm$ 10% $\frac{1}{2}$ W	R.S. Components	R4
13	DE 415	Transformer	1	Primary 0-120V, 0-120V Secondary 0-54V, 12% load regulation 55 V.A.		TR1
14		Transistor	1	2N4347	R.C.A.	VT1
15		Series Parallel Selector	1	With white arrow	McMurdo	SK1 & PL1
16	DE 151	P.C. Board	1	1/16" SRBP Cu.Clad.		
17		Diode	5	10D1	I.R.	D2-D6
18		Diode	1	12M5.6T5	I.R.	D1
19		Resistor	1	470 ohm $\pm$ 5% 12W W24	Erie	R1
20		Resistor	1	6.8 ohm $\pm$ 5% 6W W22	Erie	R3
21		Resistor	1	62 ohm $\pm$ 5% $\frac{1}{2}$ W TR5	Electrosil	R2
22		Pre-set Potentiometer	1	470 ohm 0.1W Mon.Horiz.	R.S. Components	VR2
23		Fuseholder	1	Printer Circuit Type No. 5209	Tape Recorder Spares	FS2
24		Fuse	1	20m x 5m 800mA		
25		Resistor W/W	1	1.8R $\pm$ 5% 2.5W	R.S. Components	R6
26		Resistor	1	16R $\pm$ 2% $\frac{1}{2}$ W TR5	Electrosil	R7
27		Resistor Hystab.	1	820R $\pm$ 5% $\frac{1}{2}$ W	R.S. Components	R8
28		Resistor Moulded Carbon	1	220K $\pm$ 10% $\frac{1}{2}$ W	R.S. Components	R4
29		Capacitor	1	Polyester 250V DC Wkg 0.1uF		C2
30		Resistor	1	Carbon $\frac{1}{2}$ W 100R $\pm$ 10%		R5



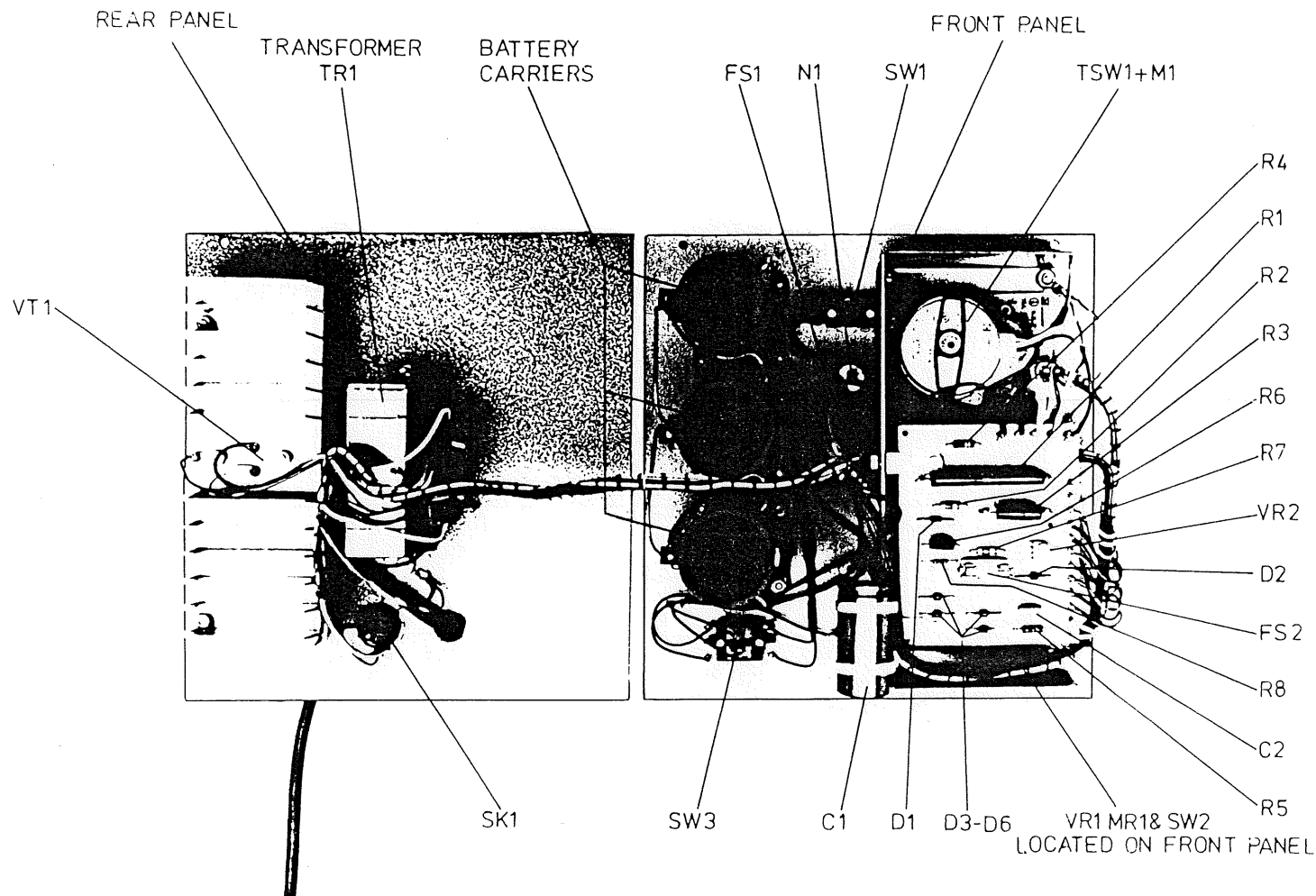
BATTERY CHARGER



GRAPH OF CHARGING PERIODS



CIRCUIT DIAGRAM-BATTERY CHARGER



INTERNAL VIEW OF FRONT & REAR
PANEL REMOVED FROM CASE